

Amendments to the Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of claims:

1. (Currently amended) A powered orthotic device for therapeutic training of movement of a body part of a person, the device comprising:

 a brace adapted to be coupled to the body part and having a length such that the brace traverses a joint of the person, said brace including a mechanism for attaching the brace to the body part of the person;

 a sensor adapted to be coupled to at least one muscle of the person and wherein in response to an attempt by the person to move the body part, said sensor senses an electromyographic signal of muscles associated with motion of the body part about the joint and provides a sensor signal output in response thereto;

 a processor, coupled to the sensor, that provides an actuator signal based on the sensor signal output; and

 an actuator coupled to receive the actuator signal from said processor, such actuator having a rotational energy output coupled to the brace at a location proximate to a portion thereof adjacent to the joint;

 wherein the processor includes program code for implementing a control algorithm that causes the actuator to provide a force to the brace in a first direction having a magnitude which is proportional to a magnitude of the sensor signal and in a second direction a spring return force, such forces causing motion of the body part with respect to the joint, so as to facilitate use of the device in therapeutic movement training.

2. (Previously presented) The device of Claim 1 further comprising:

 an active feedback control loop coupled to the processor to control the amount of force applied to the joint by said actuator.

3. (Previously presented) The device of Claim 2 wherein said active feedback control loop further comprises means for providing a measurement of output torque to ensure an accurate application of force.

4. (Currently amended) The device of Claim 1 further comprising:

a cable drive coupled between said actuator and said brace such that in response to the rotational energy output ~~movement~~ of the actuator, said cable drive moves the brace.

5. (Original) The device of Claim 4 further comprising a wheelchair wherein:

at least a portion of said cable drive system is coupled to said wheel chair; and
said actuator is disposed such that the mass of said actuator is substantially supported by said wheelchair.

6. (Previously presented) The device of Claim 1 wherein said actuator is an electric actuator, a passive actuator, a hydraulic actuator, a pneumatic actuator or a combination thereof.

Claims 7 and 8 (Cancelled)

9. (Currently amended) A powered orthotic device for therapeutic training of movement of a body part of a person, the device comprising:

a brace adapted to be coupled to the body part and having a length such that the brace traverses a joint of the person;

a sensor adapted to be coupled to at least one muscle of the person wherein in response to an attempt by the person to move the body part, said sensor senses an electromyographic signal of muscles associated with motion of the body part about the joint and provides a sensor signal output in response thereto;

a processor, coupled to the sensor, that provides an actuator signal based on the sensor signal output;

an actuator coupled to receive the sensor signal from said processor, such actuator having a rotational energy output coupled to the brace at a location proximate to a portion thereof adjacent to the joint;

wherein the processor includes program code for implementing a control algorithm that causes the actuator to provide a force to the brace in a first direction having a magnitude which is proportional to a magnitude of the sensor signal and in a second direction a spring return force, such forces causing motion of the body part with respect to the joint, to facilitate use of the device in therapeutic movement training; and

a control means coupled to the processor to aid the actuator, said control means including means for making a low impedance measurement of output torque and for providing a feedback signal to said actuator to ensure an accurate application of the force in the first direction provided by said actuator.

10. (Currently amended) The powered orthotic device of Claim 9 wherein:

said brace comprises a hinge mechanism having first and second hinge portions and first and second straps coupled to respective ones of the first and second hinge portions wherein said first and second hinge portions allow the first and second straps to move relative to each other in accordance with normal movement of a joint which the brace traverses and wherein the device further comprises:

a cable wheel coupled to said brace, said cable wheel having a groove;

a continuous cable coupled to said cable wheel and coupled to said rotational energy output, said continuous cable disposed around the cable wheel within the groove wherein said continuous cable is retained on one of the first and second straps such that when the cable is moved, the cable wheel rotates, causing the first and second straps to move relative to each.

Claims 11-20 (Cancelled)

21. (New) The device of claim 2, wherein the control loop has a gain control which can be adjusted in accordance with the needs of the person.

22. (New) The device of claim 9, wherein the control means has a gain control which can be adjusted in accordance with the needs of the person.